

United States Patent [19]

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Chatwani et al.

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[54] **APPARATUS FOR PROVIDING FOR
AUTOMATIC TOPOLOGY DISCOVERY IN
AN ATM NETWORK OR THE LIKE**

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[21] **Appl. No.:** 484,656

[22] **Filed:** Jun. 7, 1995

Related U.S. Application Data

[60] Division of Ser. No. 86,431, Jun. 29, 1993, abandoned,
which is a continuation-in-part of Ser. No. 959,732, Oct. 13,
1992, Pat. No. 5,519,707.

[51] **Int. Cl.⁶** **G06F 11/30**

[52] **U.S. Cl.** **395/200.11**

[58] **Field of Search** 364/DIG. 1 MS File,
364/DIG. 2 MS File; 395/200.01, 200.06,
200.1, 200.11; 370/17, 53, 54

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,545,013	10/1985	Lyon et al.	364/200
4,644,532	2/1987	George et al.	370/94.1
4,827,411	5/1989	Arrowood et al.	364/200
4,847,830	7/1989	Momirov	370/58.1
4,984,264	1/1991	Katsube	379/197
5,012,466	4/1991	Buhrke et al.	370/62
5,031,093	7/1991	Hasegawa	370/17
5,038,343	8/1991	Lebizay et al.	370/60
5,049,873	9/1991	Robins et al.	340/825.06
5,062,103	10/1991	Davidson et al.	370/58.1
5,079,767	1/1992	Perlman	370/200
5,101,348	3/1992	Arrowood et al.	395/200
5,140,585	8/1992	Tomikawa	370/60.1
5,150,464	9/1992	Sidhu et al.	395/200
5,164,938	11/1992	Jurkevich et al.	370/60
5,165,091	11/1992	Lape et al.	370/94.1
5,177,736	1/1993	Tanabe et al.	370/60

5,251,204	10/1993	Izawa et al.	370/15
5,280,610	1/1994	Travis, Jr. et al.	395/500
5,287,535	2/1994	Sakagawa et al.	370/60
5,303,343	4/1994	Ohya et al.	395/500
5,307,491	4/1994	Periozi et al.	395/500
5,309,434	5/1994	Mackawa	370/62
5,313,463	5/1994	Gore et al.	370/110.1
5,327,420	7/1994	Lyles	370/60
5,327,486	7/1994	Wolff et al.	373/96
5,339,318	8/1994	Tanaka et al.	370/110.1
5,345,446	9/1994	Hiller et al.	370/60.1
5,390,170	2/1995	Sawant et al.	370/58.1
5,432,777	7/1995	Le Boudcc et al.	370/60
5,432,790	7/1995	Hluchyj et al.	370/95.1

OTHER PUBLICATIONS

Ross Finlayson, "Bootstrap Loading Using TFTP", Net-
working Group Request for Comments: 906. Jun. 1984. pp.
1-4.

J. Postel, "User Datagram Protocol", Request for Com-
ments: 768. Aug. 28, 1980. pp. 1-3.

K. R. Sollins, "The TFTP Protocol (Revision 2)", Network
Working Group Request for Comments: 783. Jun. 1981. pp.
1-9.

(List continued on next page.)

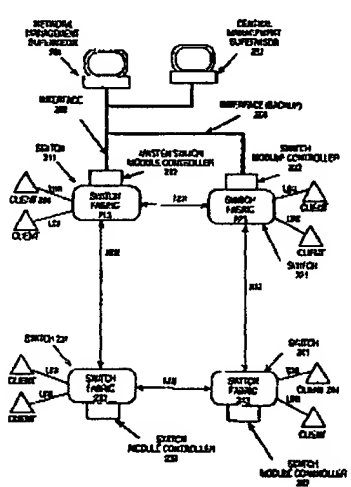
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man

[57] **ABSTRACT**

An asynchronous transfer mode (ATM) network or the like
employing a method and apparatus for automatically deter-
mining the topology of the network is described. The
method and apparatus provides for each switch in the
network transmitting on each of its ports link advertisement
messages (without processing intervention by intermediate
switches). The link advertisement messages are received by
neighbor switches and forwarded to a topology manager.
The topology manager constructs network topology profile
information based on received link advertisement messages.
Further, the topology manager is able to verify bidirection
links based on the received link advertisement messages.

7 Claims, 53 Drawing Sheets



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      520 MULTICAST?
      412768 COMMUNICAT?
L1      217 MULTICAST? (P) COMMUNICAT?

=> s message (2a) server#
      38600 MESSAGE
      4490 SERVER#
L2      285 MESSAGE (2A) SERVER#

=> s l1 and l2
L3      11 L1 AND L2

=> s group (3a) l2
09:53:49 COPY AND CLEAR PAGE, PLEASE
      539501 GROUP
L4      0 GROUP (3A) L2

=> d his

      (FILE 'USPAT' ENTERED AT 09:51:09 ON 14 MAR 1997)

      SET PAGELength 62
      SET LINELENGTH 78
L1      217 S MULTICAST? (P) COMMUNICAT?
L2      285 S MESSAGE (2A) SERVER#
L3      11 S L1 AND L2
L4      0 S GROUP (3A) L2

=> s l1/ab
      73 MULTICAST?/AB
      67588 COMMUNICAT?/AB
L5      30 (MULTICAST?/AB (P) COMMUNICAT?/AB)

=> s l2/ab
      6163 MESSAGE/AB
      687 SERVER#/AB
L6      14 (MESSAGE/AB (2A) SERVER#/AB)

=> s multicast?/ab and network?/ab
      73 MULTICAST?/AB
      21435 NETWORK?/AB
L7      52 MULTICAST?/AB AND NETWORK?/AB

=> s s client? and server? and broker#
      1416639 S
      3077 CLIENT?
      106 S CLIENT?
      (S(W)CLIENT?)
      5101 SERVER?
      387 BROKER#
L8      0 S CLIENT? AND SERVER? AND BROKER#

=> s client? and server? and broker#
      3077 CLIENT?
      5101 SERVER?
      387 BROKER#
L9      22 CLIENT? AND SERVER? AND BROKER#

=> s l6 or l5 or l7 or l9
L10     93 L6 OR L5 OR L7 OR L9

=>
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